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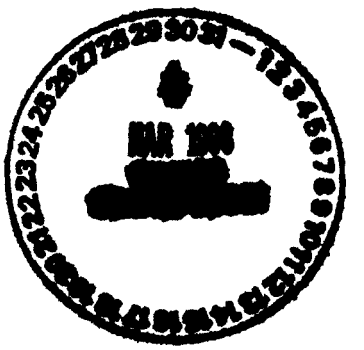
RF/RMRS-97-045

Reconnaissance Level Characterization Plan For Building 123

September 1997



RECONNAISSANCE LEVEL CHARACTERIZATION PLAN FOR BUILDING 123

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ACRONYMS

ACM	Asbestos containing material
AHA	Activity Hazard Analysis
AHERA	Asbestos Hazard Emergency Response Act
APO	Analytical Projects Office
Be	Beryllium
CDPHE	Colorado Department of Public Health and Environment
cm^2	Square Centimeters
DOE	U S Department of Energy
DOP	Decommissioning Operations Plan
dpm	Disintegrations per minute
DQO	Data Quality Objective
EPA	U S Environmental Protection Agency
MDA	Minimum Detectable Amount
PA	Protected Area
PCB	Polychlorinated biphenyl
PLM	Polarized Light Microscopy
RAD	Radioactive
RBA	Radiological Buffer Area
RCRA	Resource Conservation and Recovery Act
RFETS	Rocky Flats Environmental Technology Site
RLC	Reconnaissance Level Characterization
RLCR	Reconnaissance Level Characterization Report
RMRS	Rocky Mountain Remediation Services, L L C
RWP	Radiological Work Permit
SAA	Satellite Accumulation Area
WSRIC	Waste Stream Residue Identification and Characterization

RECONNAISSANCE LEVEL CHARACTERIZATION PLAN FOR BUILDING 123

1.0 INTRODUCTION

Due to the change in mission of the Rocky Flats Environmental Technology Site (RFETS) from the production of nuclear components to environmental cleanup and shutdown, Building 123 and its associated facilities have no identified mission after Fiscal Year 1997 It has, therefore, been determined by site management that the Building 123 should be decommissioned to a safe and stable configuration to reduce operating costs and hazards The location of B123 is identified in Figure 1-1

1.1 PURPOSE

The purpose of this characterization plan is to outline the data requirements and methodology for Reconnaissance Level Characterization of Building 123 This effort identifies the type, quantity, condition, and location of radioactive and hazardous materials which are, or which may be, present as residual contamination in the subject facilities The compilation of facility information contained herein, in conjunction with the Building 123 project files established during this investigation, brings together pertinent data from various sources to serve as a practical reference for project use

1 2 SCOPE

This report is prepared in support of the Building 123 Characterization for the U S Department of Energy (DOE) at the RFETS located near Golden, Colorado The information presented in this plan specifically pertains to Building 123, the review of historical records and the collection of process knowledge information covers the operational time period for the facility from original construction to present

1 3 DATA LIFE CYCLE

There are three aspects of the data life cycle that apply to the characterization process Planning, Implementation, and Assessment To produce a usable document (i e , Reconnaissance Level Characterization Report) each of the three must be applied in sequence

The planning process uses the Data Quality Objectives (DQOs) identified in the Decommissioning Characterization Protocols to determine data needs and quality and survey design This is the initial planning phase for all characterization activities

The second phase of the characterization process is implementation This phase includes the assessment of historical documentation (scoping survey) concerning the operations of a site and any associated chemical or radiological inventory Additionally, the physical survey is accomplished using the design as outlined during the planning phase

The final phase of the life cycle is the assessment of information gathered during the implementation phase The data is evaluated against the DQO criteria and a Reconnaissance Level Characterization Report (RLCR) is developed that outlines results and conclusions

In the following sections the three phases of the data life cycle are developed in detail for the B123 decommissioning project

Figure 1-1 Site Map

2.0 PLANNING

To ensure the collection of usable data it is necessary to formulate the objectives of the project The development of appropriate objectives was accomplished through the Data Quality Objective (DQO) process The results of this process are presented in the following sections of this plan

2.1 CHARACTERIZATION OBJECTIVES

The Reconnaissance Level Characterization objectives are based on the questions presented in Section 7 0 of the DOE Decommissioning Handbook (DOE/EM-0142P)

This plan was developed to specify the data collection requirements necessary to provide a baseline of information for use during decommissioning activities The information obtained by implementing this plan will be compiled into the RLCR Ultimately, the data may be used to determine the risks to the environment and personnel during these activities (dismantling, decommissioning, etc)

The following questions and answers were used to develop the sampling requirements for this project

1. **What is the end use of the facility or structure?**

   Due to the change in mission of the Rocky Flats Environmental Technology Site (RFETS) from the production of nuclear components to environmental cleanup and shutdown, Building 123 and its associated facilities have no identified mission after Fiscal Year 1997 It has, therefore, been determined by site management that B123 should be decommissioned to a safe and stable configuration to reduce operating costs and hazards

2. **What types of chemical, physical/biological, or radiological hazard are being evaluated?**

   The media sampling that will be required will include all types of building materials and environmental samples as necessary The following analytical parameters will be reviewed Sampling requirements will be based on process knowledge and information gathered during the historical assessment presented in Section 3 0

   Asbestos
   PCBs
   Excess Chemicals
   Lead
   Beryllium
   Radioactive materials

3. **What level of worker protection is required to perform characterization in the facility, structure or environs?**

   The level of worker protection will be based on the data collected during the Reconnaissance Level Characterization The following issues will be evaluated

   Administrative Controls (i e , limit time in area)
   Engineering Controls (i e , containment requirements)
   Personal Protective Equipment (i e , respirator requirements)

4 What type of instrumentation is required?

The instrumentation required is specified in Appendix A

5 Has all facility structural data been reviewed?

This data was reviewed during the historical assessment presented in Section 3 0

6 Have all suspect materials been identified?

No The purpose of the Reconnaissance Level Characterization is to identify suspect materials through sampling and analysis

7. Are there any regulatory and statistical drivers for sampling frequency?

There are no regulatory or statistical drivers for sampling frequency corresponding to B123 Sampling frequency will be based on professional judgement and methods presented in the Characterization Instructions and Protocols (Appendix A and B, respectively)

For this plan, the DQO process was used and the rationale for each step is outlined below

8. Why perform this Reconnaissance Level Characterization?

The Reconnaissance Level Characterization will be performed to determine the hazards to workers during decommissioning activities

9 What decisions will be made from this Reconnaissance Level Characterization?

The level of worker protection required for decommissioning activities will be determined based on the results of the Reconnaissance Level Characterization The data will also be used to guide D&D decisions and final radiological survey planning

10 What information is required to make the decision?

The following information will be required to resolve the decision

Historical Information
Media Sampling (as outlined in Table 3-1)

11 What is the scope of this Reconnaissance Level Characterization?

The methodology contained in this document applies to all buildings and areas associated with B123 including B113, B114 and B123S

12. What is the basis for the decision?

Data collected during this project will be evaluated in accordance with all applicable regulatory or RFETS requirements If any of these requirements are not met, alternative actions (i e , Personal Protective Equipment) may be necessary

13 What are the limits on decision errors?

The error rates for the data collected during this study are incorporated into the detection limits for the analysis parameters Therefore, it has been determined the these limits are acceptable for the DQOs

14. How will the survey design be optimized?

The data collection design will be optimized by utilizing Radiological Characterization Instructions (Appendix A) and Decommissioning Characterization Protocols (Appendix B) that have been developed for this project

3.0 IMPLEMENTATION

This section provides information necessary to implement the requirements of the planning (DQO) task of this project

3.1 HISTORICAL ASSESSMENT

A detailed examination of process knowledge and documents, relating to Building 123 was initiated in April 1997 As part of this examination, a comprehensive survey of historical records was undertaken to determine the location and character of any radioactive and hazardous contaminants which may be present in the area The general conclusions drawn from this examination are as follows

Presently, Building 123 is in a fully operational condition All required utility services (i e , electrical service, water supply, and natural gas supply) are active Building air ventilation and High Efficiency Particulate Air (HEPA) filtered exhaust systems, instrument air supply compressors, and necessary radiological monitoring instrumentation systems are in normal continuous operation All manually-actuated and automated fire/alarm suppression systems are operational All installed facility security and radiological alarm systems are normal All remote-handling mechanisms and auxiliary facility support equipment are operational or are available for activation and use

Building 123 presently houses a small inventory of materials and equipment which are radioactive, radioactively-contaminated, and/or contain hazardous substances

Equipment which was thought to contain hazardous substances were put in the Idle Equipment Program This ensured the equipment fluids would be tested for the presence of hazardous substances Equipment fluids found to contain a hazardous substance were removed during deactivation Due to the age of the facility, considerable amounts of asbestos may be present in the insulation and building materials Lead may be present in the vault shielding and in some of the building materials

Although not all inclusive, the following list contains some of the hazardous materials which have been used in B123 and will be addressed during the characterization Appendix B contains the sampling protocols for the contaminants listed below

3 1 1 Asbestos

A complete asbestos inspection of the building will be conducted in accordance with Colorado Department of Public Health and Environment (CDPHE) and Asbestos Hazard Emergency Response Act (AHERA) regulations by a state certified inspector Table 3-1 presents results of previous sampling efforts and additional sampling requirements

3.1 2 Polychlorinated biphenyls (PCBs)

A PCB evaluation will be conducted for B123 Based on a review of construction information, Building 123 was erected prior to 1980 Therefore, B123 is suspected to contain PCB materials The B123 facilities fluorescent lights and fluorescent light ballast will be removed and disposed in accordance with appropriate RFETS procedures

3 1 3 Excess Chemicals

Although there were hazardous chemicals in the B123 facilities, all excess and hazardous chemicals will be removed from B123 facilities during the deactivation process Should a chemical be found during the decommissioning process, the chemical will be handled in accordance with existing chemical identification and handling procedures

3.1 4 Lead Paint

A complete lead inspection and sampling event of Building 123 will be completed under this plan The analysis of paints will include total lead, chromium, cadmium and arsenic Computer modeling and leachability studies have demonstrated that lead in paint, if it exists, will not create a disposal problem The amount of lead in the painted surfaces will be determined and compared to the previous model as necessary to support the decommissioning effort

3 1.5 Beryllium

Beryllium (Be) metal was removed from Building 123 facilities during the deactivation process Historically, Be was handled in Rooms 111 and 112 Sampling activities for Be will be conducted under this plan

3.1 6 Radioactive Materials

Historical reports indicate that there are no areas within Building 123 which have significant amounts of unidentified/uncontrolled/unmarked radioactive contamination There are some areas which are clearly identified as contamination areas As equipment is removed from Building 123 facilities, sampling and analysis for fixed radiation contamination will be completed Current planning is to decontaminate all rooms which handled significant quantities of radioactive material Preliminary Scoping Surveys of all laboratories and RMMAs/RCAs will be conducted under this plan

3 1 7 Hazard Assessment

An assessment of the hazards that may be encountered during specific decommissioning activities will be performed through walkdowns and job safety analyses This information will be incorporated irtto the planning process of each activity to ensure maximum protection of the worker

3.1.8 Sampling

Table 3-1 lists the locations and the types of samples that are required for characterization purposes A trained sampling team will be selected to perform the sampling activities required for characterization purposes Analysis for characterization purposes will be performed using Environmental Protection Agency (EPA) approved procedures through laboratory facilities Data Quality Objectives are established for the analytical methods referenced and are on file at the onsite Analytical Projects Office (APO) in Building 881 Sampling and analysis activities will be conducted in accordance with the "characterization protocols" which describe the methods for sampling and analysis for various contaminants of concern including lead, asbestos, PCBs, and radioactive constituents

Table 3-1 also includes the descriptions associated with each area, process information regarding the processes conducted in each room, radioactive and/or hazardous considerations (i e , known materials associated with a specific process or area), and the confirmation analysis that will be performed Lead and Asbestos surveys will be conducted by a state-certified inspector who will determine appropriate sampling locations

Table 3-1 Building 123 Survey Design

W = Wall Board
T = Tile (Floor)
P = Pipe Insulation
Y = Sampling required
N= Not Present
N S= Not Suspect

Room Number	Asbestos	Be	Lead Paint	Rad. Cont.	Acids Used	Misc.
100 West Entry	W/T/P	NS	Y	N	N	
101 Office	W/T/P	NS	Y	N	N	
101A Office	W/T/P	NS	Y	N	N	
102 Office	W/T/P	NS	Y	N	N	
102A Office	W/T/P	NS	Y	N	N	
103 Reagent Lab	W/T/P	Y	Y	N	N	RCRA ck pts
103A Special Bioassay	W/T/P	Y	Y	N	Y	RCA/RMMA
105 Spike & Electroplating Prep	W/T/P	NS	Y	Y	Y	RCRA/ RMMA
106 Office	W/T/P	NS	Y	N	N	
107 Office	W/T/P	Y	Y	N	N	
107A Office	W/T/P	NS	Y	N	N	
109 Office	W/T/P	Y	Y	Y	N	
109A Storage	W/T	Y	Y	N	N	
109B Storage	W/T	Y	Y	N	N	
109C Storage	W/T	NS	Y	N	N	RCA/RMMA
111 Beryllium & Bacteriology	W/P	Y	Y	N	Y	
112 Environmental Soil Lab	W/P	Y	Y	N	Y	RCA
113 Men's Restroom	P	NS	Y	N	N	
113A Janitor's Storage	P	NS	Y	N	N	
113B Men's Locker Room	P	NS	Y	N	N	
115 Office	P	NS	Y	N	N	
121 Hallway near 103 & 133	W/P	Y	Y	N	N	
121A Office	N	NS	Y	N	N	
122 Office	W/T/P	Y	Y	N	N	
123 HPI Lab	W/T/P	NS	Y	N	N	RCA/RMMA
123A Hall to Exit Lockers	P	Y	Y	N	N	

Room Number	Asbestos	Be	Lead	Rad. Cont.	Acids Used	Misc.
124 Electroplating Lab	W/T/P	NS	Y	N	N	RCRA
125 Radioactive Spikes	W/T/P	NS	Y	N	Y	
126 Gas Chromatograph	W/T/P	Y	Y	N	N	RCA
126A Office	W/T/P	NS	Y	N	N	
126B Office	W/T/P	NS	Y	Y	N	
126C Office	W/T/P	NS	Y	N	N	
127 Bioassay	WT/P	NS	Y	N	Y	RCA/RMMA
128 Office	W/T/P	NS	Y	N	N	RCA/RMMA
129 Office	N	NS	Y	N	N	
131 Electronics Lab	W/P/T	Y	Y	N	N	
131C Office	W/P/T	NS	Y	N	N	
132 East Utility Room	W	Y	Y	N	N	
133 External Dosimetry	W/P/T	NS	Y	N	N	
133A Office	W/P/T	NS	Y	N	N	
133B Office	W/P/T	NS	Y	N	N	
133C Office	W/P/T	NS	Y	N	N	
135 Alpha Spec & Liquid Scint Lab	W/P/T	NS	Y	N	N	RCA Tritium & C-14
137 Small Room at Truck Dock	N	NS	Y	N	N	
138 Office	N	NS	Y	N	N	
140 Hallway near 140A	T/P	NS	Y	N	N	
140A Office	T/P	NS	Y	N	N	
141 Office	W/T	NS	Y	N	N	
142 Office	W/T	NS	Y	N	N	
143 Office	T	NS	Y	N	N	
143A Office	T	NS	Y	N	N	
144 Office	W/T	NS	Y	N	N	
146 Office	W/T	NS	Y	N	N	
147 Office	W/T	NS	Y	N	N	RCA, lead bricks
150 Office	W/T	NS	Y	N	N	

Room Number	Asbestos	Be	Lead	Rad. Cont	Acids Used	Misc
151 Office	W/T	NS	Y	N	N	
154 SW Entry Vestibule	W/T	NS	Y	N	N	
155 Office	W/T	Y	Y	N	N	
155A TLD Irradiator	N	NS	Y	N	N	Sealed Gamma Source
156 Use of Radioactive Spikes, etc	W/T	NS	Y	N	Y	
157 Environmental Sample Prep Lab	W/T	Y	Y	Y	Y	RCA, RCRA
158 Sample Receiving Station	W/T	Y	Y	N	N	RCA
159 West Utility Room	W	Y	Y	N	N	
160 Office	W/T	NS	Y	N	N	
161 Office	W/T	NS	Y	N	N	
162 Office	W/T	NS	Y	N	N	
162A Office	W/T	NS	Y	N	N	
162B Office	W/T	Y	Y	N	N	
163 Air Sample Counting Room	W/T	Y	Y	N	N	RCA/RMMA
164 Hallway in front of 163	W/T	NS	Y	N	N	
165 Computer Room (SE corner)	W/T	NS	Y	N	N	

4.0 ASSESSMENT

The assessment stage of the Building 123 data life cycle will include an evaluation of data and any conclusions that may be drawn from the data The information collected will be detailed in the characterization report

4 1 DATA EVALUATION

The data will be evaluated for completeness and adherence to the appropriate protocols

5.0 REFERENCES

DOE/EM-0142P - *Decommissioning Handbook*

"Decommissioning Characterization Protocols" (August, 1997) (Draft)

MARSSIM - *Multi-Agency Radiation Survey and Site Investigation Manual* (Draft)

NUREG/CR5849 - *Manual for Conducting Radiological Surveys in Support of License Termination* (Draft)

Appendix A

Radiological Survey Instructions

Radiological Survey Instructions

Location/Room: Bldg 123, Room 163

	Radiological Survey[2]			
Item/Area Description[1]	**# of Alpha Beta Swipes**	**# of Direct Alpha Beta Measurements**	**Scan Survey[3]**	**Special Instructions**
Item #1 Floors	10	10	N/A	Obtain measurements on floor surfaces throughout the room
Item #2 Window A/C Units	A minimum of 1 measurement per component	A minimum of 1 measurement per component	N/A	Obtain measurements on air intakes of each A/C unit
Item #3 Misc Cabinets, Desks, Bookcases, etc	A minimum of 1 measurement per component	A minimum of 1 measurement per component	N/A	Obtain measurements on accessible surfaces of each cabine t/desk/bookcase, etc

Notes

[1]See attached map of building layout
[2]Surveys to be performed in accordance with 4-K-62-ROI-03 01, *Performance of Surface Contamination Surveys* Other radiological references are 1-P73-HSP-18 10, *Radioactive Material Transfer and Unrestricted Release of Property and Waste,* 4-S23-ROI-03 02, *Radiological Requirements for Unrestricted Release,* and 4-N83-REP-1108 *Radioactive Material Management Area (RMMA) Determination*
[3]Perform an alpha/beta scan survey of the percentage of the accessible surfaces, including fixed equipment, as listed

Review and Approval

Prepared By _____ Date _____

Reviewed By _____ Date _____

Radiological Survey Design

To meet the DQOs surveys must be conducted in a well defined consistent manner There are three important aspects of designing a well defined consistent survey

Instrumentation
Survey Locations/Instruction
Procedures/Protocols

These must be accomplished to maximize efficiency and quality data which may be used to determine building status

Radiological Survey Instructions

To define the specific survey requirements for this project, characterization survey radiological instructions will be developed for each building/area These instructions include a description of the item/area, number of alpha/beta swipes, the number of direct measurements and special instruction These instructions were developed to meet DQO criteria The specific instructions for the B123 are presented in below

Radiological Procedures/Protocols

The appropriate procedures/ protocols to conduct the requirements of the characterization survey instruction are contained in Appendix B

Radiological Instrumentation

Radiological instrumentation (portable and fixed) for making direct field measurements and laboratory analysis respectively will be utilized during characterization activities Instrumentation which is reliable, suited to the physical conditions at the site, and capable of detecting the radiations of concern (at the required detection levels) will be chosen Instrumentation which may be used for this project is presented in Table 6-1 Additional equivalent instrumentation may be used if approved by radiological engineering

Table A-1 Radiological Instrumentation

Instrument	Count Type	Allowable Background Counts	Acceptable Application	MDA (dpm/100 cm^2)
Bicron w/ A100 Probe	60 sec (alpha)	2	Direct Alpha Surveys	55
Bicron w/ B50 Probe	60 sec (beta)	250	Direct Beta Surveys	610
NE Electra W/ DP6 Probe	60 sec (alpha) 60 sec (beta)	2 700	Direct Alpha Surveys Direct Beta Surveys	60 455
Eberline SAC-4	60 sec (alpha)	1	Removable Alpha Swipes	18
Eberline BC-4	60 sec (beta)	200	Removable Beta Swipes	205
LB-5100LW	60 sec (alpha) 60 sec (beta)	0 5 4	Simultaneous Removable Alpha and Beta Swipes	20 35

Appendix B

Decommissioning Characterization Protocols

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ATTACHMENTS

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TABLES

1.0 INTRODUCTION

Over the next several years the facilities at the Rocky Flats Environmental Technology Site (RFETS) will be deactivated and decommissioned (including dismantlement) This effort will expose the workers at RFETS to new processes and different risks than those previously encountered In order to properly plan the new decommissioning tasks and to protect the workers while they complete these tasks, a method of identification (characterization) of the potential hazards has been developed and is presented herein

2.0 PURPOSE

Characterization as identified in this procedure is the process of obtaining information about a site/facility (hereafter referred to as a site) which identifies the chemical, physical, biological, and radiological hazards within and around the immediate site The purpose of this document is to provide guidelines for a consistent and systematic approach to characterization which includes the use of data quality objectives (DQOs), as outlined in EPA QA/G-4,"Data Quality Objectives Process", and tailored to decommissioning sites The characterization information obtained using these protocols can be used to support selection of decommissioning technology alternatives, development of a project specific project execution plan (PEP), development of a project specific health and safety plan (HASP) including an initial exposure assessment and activity hazard analysis (AHA) forms, development of the project specific waste management plan (WMP), determination of waste volumes, and the method of releasing a facility for reuse or demolition

3.0 SCOPE

The scope of this procedure is to provide characterization guidelines which can be used in any of the 5 characterization phases, (see Section 4) Note however, that the guidelines allow for a graded approach to each characterization phase and decommissioning site The guidelines are used to develop a set of characterization instructions which are used to gather the desired information If, the amount of information being obtained is large, there is a need to maintain strict formality in obtaining the information, or there is a requirement to submit the characterization instructions for a formal review, the instructions may be developed into a characterization plan, (i e , Reconnaissance Level Characterization Plan)

4.0 CHARACTERIZATION PHASES

The following characterization phases, identified for use at RFETS, were derived from NUREG/CR-5849, *Manual for Conducting Radiological Surveys in Support of License Termination* DOE/EM-0142P, *Decommissioning Handbook*, DOE/ DRM, *The Decommissioning Resource Manual*", and NUREG-1575, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*

1 Safety Characterization
2 Scoping Characterization
3 Reconnaissance Characterization
4 In-Process Characterization
5 Final Building Survey
6 Independent Verification Survey of the Final Survey

A brief description of each phase is provided in the following paragraphs

4 1 SAFETY CHARACTERIZATION

Safety Characterization involves gathering information about the safety of a site before anyone is permitted to enter This phase of characterization is necessary for older sites which have been unoccupied for substantial periods of time Most of the sites at RFETS have been continuously occupied and do not require a safety characterization as the site environment is known and verified through routine surveys Areas within a site which have not been occupied will require a Safety Characterization This is accomplished by using the RFETS' Confined Space Entry Procedure

4.2 SCOPING CHARACTERIZATION

The purpose of this characterization phase is to gather information on the physical, hazardous, radiological and chemical condition of the facility This includes reviewing historical records, interviewing building personnel, reviewing operational records, reviewing radiological deficiency reports (RDRs) and any other pertinent building information including historical survey reviews Additionally, at this time an evaluation should be made of any type of radioactive sources in the structure, (i e , check sources, smoke detectors, moisture gauges, etc)

The Scoping Characterization information provides a basis for preliminary evaluations of decommissioning efforts and aids in identifying the need for more extensive Reconnaissance Characterization and In-process Characterization surveys

4 3 RECONNAISSANCE CHARACTERIZATION

This phase of characterization is performed to establish a definitive baseline of information when planning for the decommissioning activities This element includes reviewing information from the scoping characterization against the planned decommissioning activities to determine if additional characterization is necessary to support the chosen decommissioning activities or support selection of a different decommissioning approach The additional sampling/survey instructions would be developed into a Reconnaissance Level Characterization Plan (RLCP) The reconnaissance characterization information obtained by completing the RLCP feeds into the following documents Reconnaissance Level Characterization Report (RLCR), Waste Management Plan, the Decommissioning Waste Stream and Residue Identification and Characterization Report, the project HASP, and the project's Final Survey Plan The RLCR is a snap shot of all the known characterization information about the decommissioning site

4 4 IN-PROCESS CHARACTERIZATION

The In-Process phase of characterization is used to verify daily pre-job conditions and to evaluate the effectiveness of on-going decontamination/decommissioning activities in preparation for final survey actions The in-process characterization aids in identification of new hazards which may be uncovered during the facility decommissioning

4.5 FINAL BUILDING CHARACTERIZATION SURVEY

As the decontamination process is completed and before the building or structure is dismantled, a final survey is completed The final building survey is used to ensure the building surfaces and/or structure meet the release criteria established by the Department of Energy for the Rocky Flats Environmental Technology Site Each site's Final Building Survey is completed using a Final Building Characterization Survey Plan The Final Building Characterization Survey Plan is written using the final survey instructions developed from the guidelines in this procedure

4 6 INDEPENDENT VERIFICATION OF THE FINAL BUILDING CHARACTERIZATION SURVEY

As the characterization and final survey activities are completed, an independent verification is completed by an independent survey team, (as designated by the Department of Energy) The independent survey is outside the scope of this document

5.0 CHARACTERIZATION OBJECTIVES AND SURVEY INSTRUCTIONS

In order to eliminate duplication of effort and to minimize costs, it is important to focus the characterization efforts on obtaining the desired characterization information which has the quality aspects to make the data useful Before extensive survey packages or large scale surveys are performed, it must be decided just how much data is required to complete a competent evaluation of existing and potential hazards in the facility, cluster or environs in which decommissioning activities will be performed The proper DQOs can be identified and built into the characterization instructions by answering the questions listed below These questions have been derived from EPA QA/G-4, "The Data Quality Objectives Process" seven step process and modified to make the process more directly applicable to decommissioning efforts

As data is acquired by qualitative and quantitative means, the results will be evaluated and recorded in accordance with the sampling instructions The sampling analysis must support the on-going characterization, decommissioning process, and be flexible enough, yet stringent and detailed enough to allow for professional judgement by the appropriate disciplines

Step 1

a Why perform this characterization?
b What types and kind of sampling measurements are required?
c Who needs the information?
d When is the information needed?

Step 2

a What decisions will be made from this characterization information?
b Are there any alternatives to the discussion?
c What is the end use of the equipment facility or structure (free release, restricted use, low level waste, etc)?

Step 3

a What information is required to make this decision?
b What source(s) can be used to obtain the information?
c Can the desired analysis be done at RFETS or will the analysis be shipped off-site?
d What type of instrumentation is required?
e Has facility structural data been reviewed?
f What suspect materials have been identified?

Step 4

a What is the scope of this characterization?
b What is the sample population of interest?
c What types of chemical, physical/biological or radiological hazard is being evaluated?
d Are there any constraints on data collection?
e What sample measurement locations (densities) are necessary to get the desired certainty?
f To what chemical hazards could the workers be exposed?
g To what physical hazards could the workers be exposed?
h To what biological hazards could the workers be exposed?
i To what radiological hazards could the workers be exposed?

Step 5

a What is the basis for the decision?
b Are there any regulatory and statistical drivers for sampling frequency?
c What are the required instrumentation sensitivities?
d What action levels are applicable to the discussion or parameter of interest?
e Define the discussions using "If then " statements

Step 6

a What sample size is necessary for the analysis being completed?
b What number of samples/measurements will provide the desired certainty?
c What is the expected range of the parameter of interest?
d Define both types of discussion errors, (false negative and false positive)?
e What are the potential consequences of an incorrect discussion?
f What are the limits on decision errors?

Step 7

a What method will be used to obtain the desired information?
b What level of worker protection is required to perform characterization and other work in the facility, structure or environ?
c How will the survey design be optimized?
d Have data quantity and quality assurance requirements for sampling been reviewed and incorporated into the characterization process?
e Are there special data reduction, validation and reporting requirements for the survey information being obtained?
f What QA program requirements are there for these samples (i e , blanks, duplicates)?

5.1 CONDUCT OF SAMPLING MEASUREMENT OPERATIONS

When performing sampling operations unbiased, biased, affected and unaffected characterization schemes will be utilized to obtain sampling data

To implement the various characterization elements of the survey, one or more of the following method(s) will be utilized Survey instructions, sampling procedures, IWCPs or survey plans

Personnel performing sampling will be trained specialists in their respective disciplines and maintain all up-to-date qualifications

To aid in development of specific sampling/survey instructions, specific protocols have been written for

a Beryllium Characterization Protocol (Reference Attachment 1)
b Metals and Lead Characterization Protocol (Reference Attachment 2)
c Asbestos Characterization Protocol (Reference Attachment 3)
d Liquids (Reference Attachment 4)
e Protocol for Polychlorinated Biphenyls (PCBs) (Reference Attachment 5)
f Radiological Characterization Protocol (Reference Attachment 6)
g Final Radiation Survey & Site Release (Reference Attachment 7)

5.2 DOCUMENTATION

Collection and documentation of the characterization information is accomplished using existing RFETS procedures Copies of characterization information are maintained in the project's history file in accordance with QA 5 01, QA non permanent records Because decommissioning activities at RFETS are being completed as CERCLA removal actions, the appropriate discussion documents are placed in the Administrative Record

6.0 CHARACTERIZATION CHANGES

Characterization is a dynamic process As the deactivation and decommissioning efforts are completed within a facility, the hazards within that facility will be reduced and therefore the facilities characterization will change The changing characterization will be tracked using a Characterization Matrix similar to the example in Figure 1 The Characterization Matrix is initially completed when a facility has completed normal operations and the Scoping Characterization phase is completed Then, as the Facility changes, the Characterization Matrix is updated with the new information until the facility is ready to undergo it's Final Building Survey

7.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

7.1 DATA COLLECTION

Samples and measurements obtained in a accordance with this document will be collected using accepted and proven techniques and methodologies as described in the applicable site documents Quality assurance and quality control requirements for the company obtaining the samples will apply to the data gathering efforts

Figure 1 Characterization Survey and Hazard Summary Matrix

8.0 REFERENCES

E H & E M *Handbook for Occupational Health and Safety During Hazardous Waste Activities* (June 1996)

U S Department of Energy *Decommissioning Resource Manual* (August 1996)

U S Department of Energy *Decommissioning Handbook* (1994), Branch Technical Position Paper on Site Characterization for Decommissioning

EPA QA/G-4, *The Data Quality Objectives Process* Quality Assurance Management Staff, U S Environmental Protection Agency, "The Data Quality Objectives Process"

Attachment 1.0

Beryllium Characterization

Protocol

BERYLLIUM CHARACTERIZATION PROTOCOL

Introduction

This protocol describes how to perform a room by room beryllium survey The criteria outlined are specifically designed to provide occupational hazard assessment information in support of decommissioning activities while performing BE activities However, in some cases the results, particularly those from locations not affected by beryllium operations, may be used as final status results or to support a final survey

No activity that may cause Beryllium to become airborne will be authorized, without the proper personal protective equipment and controls, until smear sampling demonstrates that the area is below the plant housekeeping limit

Purpose

The survey practices outlined are specifically designed to provide occupational hazard assessment information in support of decommissioning activities within a facility However, in some cases the results, particularly those from locations not affected by beryllium operations, may be used as final status results or to support a final survey

Instruction Development

This protocol serves as a guide in the preparation of specific instructions to obtain all of the answers to the questions referenced in Section 5 0 of this protocol Additionally the instructions should contain

- Specific instructions, including sample location maps
- Beryllium Surface Sample procedure
- Beryllium Smear Sample log
- Chain of Custody
- Job Briefing sheet for sampling personnel

Implementation of Protocol

Review the locations of Beryllium Areas (Historical/Presents) Review list for information history of the building to determine locations of previous and/or current beryllium use, analysis, etc This may include review of building documentation, personnel processing information, historical Be sampling results

Perform a building walk-through and Note

- Equipment present, its size, location, and relation to beryllium use
- Labs and hoods present
- Local exhaust ventilation equipment
- HVAC system components, location

Also note other issues that may impact sample collection for Be such as radiation areas or difficult to reach areas and any additional engineering controls, equipment or PPE that may be necessary

Areas of high probability and targeted smear locations are

- Floor sumps
- Equipment foot prints
- Return air vent grills
- Horizontal pipe and duct runs
- Local exhaust duct work
- General area exhaust ventilation
- Light fixtures
- Machine working surfaces
- Machine interior surfaces
- Wall ledges and shelves
- 2-3 feet inside exhaust ducts
- Hard to get to areas not normally part of the housekeeping program

Other equipment or furniture may also need to be smeared On porous surfaces, vacuuming may need to be used to collect samples, desk drawers, bookcases, shelves and other internal surfaces may need to smeared Pay particular attention to horizontal surfaces

Areas with the highest potential for beryllium dust accumulation will be sampled IH&S personnel will determine the minimum samples to be obtained as a baseline for each affected area Additional samples will be considered based on the experience and judgment of the industrial hygienist and RCT conducting this work

Sampling of equipment should be performed in accordance with Appendix 1-1 as outlined An instruction sheet will be developed for each room, and inserted into the work package before the equipment is sampled

Each sample location will be identified on a room diagram All sample results will be provided to industrial hygiene for review and will be included in the project files

Analysis Requirements

The beryllium smears will be obtained by a trained/qualified individual All smears will be identified and tracked using a chain of custody form

The smears will be analyzed at a facility cable of a standardized analysis to a detection limit of < 1 microgram per square foot The laboratory will have a valid quality control (QC) program and will report the means of data validation methodology for each requested analysis set

Standard sample collection techniques will be used

- Use of building and room maps, mark location on maps
- Photos of sampling locations
- Use of equipment reference numbers such as hoods, tanks, pipes, gloveboxes, etc

1.1 Building 779 Decommissioning Project Characterization Instruction Sheet

1.2 Beryllium Surface Sampling Briefing

The following are general guidelines for collection of beryllium surface samples

- The supplies necessary to perform the sampling include

  - Whatman 4 Smear Tabs or equivalent
  - Glassine Bags
  - Beryllium Smear Sample Log
  - Chain of Custody Form
  - Tamper Proof Seals
  - Labels (optional)
  - Sharpie (optional)

- Dry wipe an area of 1 ft ^{2} using Whatman 4 Smear Tabs The determination of the area that is to be surveyed shall be made by the IH&S representative on the job

- Fold smear tab in half, with the potentially contaminated side in, place in a glassine bag, and place smear number on the bag **CAUTION** do not place more than one sample in a glassine bag

- Collect the sample in a manner that your hands will not come in contact with surface being sampled If contact is made, the sampler shall wash hands or change gloves before collecting the next sample

- The sample number and a detailed description of the sample collected is to be entered on the Beryllium Smear Sample Log

- The sample number consists of the Building number - Year, Month, Day - Industrial Hygienist number - Sequence number, e g , 779-961120-00-01 The Industrial Hygienist number that will be used for RCTs is 00

- Once samples have been collected, they shall be counted on the SAC-4 and the BC-4 to assess radiological contamination on the samples This will assist IH&S in determining which analytical method and which analytical facility will be utilized, and if additional packaging will be required to transport samples

- At minimum, the packaging required to transport the samples is to place the glassine bags inside of a zip lock bag, and place a tamper proof seal over the zip lock bag opening

- Complete the Chain of Custody Form If samples are to be transported to the laboratory by someone other than the sampler, then the sampler must relinquish the samples by signing the chain of custody form and the person receiving the samples must sign for the samples Samples must be under chain of custody at all times

- Transport samples to the laboratory identified by the IH&S representative for the job Formally relinquish custody for the samples to the laboratory

- Give the IH&S representative the Beryllium Smear Sample Log, associated maps and other documentation relevant to the samples collected

NOTE The Beryllium housecleaning surface contamination standard is 2 5 ug/ft^2 (2 7 ug/cm^2)

1 3 Beryllium Smear Sample Log

NAME ________________________ LABORATORY __________
EMPLOYEE # ________________________ DATE OF ANALYSIS ______
DATE __________

Sample Number	Room	Description	Area Surveyed	Ug/Sample	Ug/Ft^2 or Ug/100 Cm^2	Alpha	Beta

Attachment 2.0

Metals And Lead Characterization

Protocol

METALS AND LEAD CHARACTERIZATION PROTOCOL

Introduction

This protocol establishes the framework for the characterization of lead and specific metals such as chromium and zinc oxide in facilities to be decommissioned

Purpose

The approach utilized conforms with OSHA requirements 1926, Subpart D and Z Additionally the approach ensures conformance with the site specific HSPs which address the handling and sampling of carcinogenic waste

Instruction Development

This protocol serves as a guide in the preparation of specific instructions to obtain all of the answers to the questions referenced in Section 5 0 of this protocol Additionally the instructions should contain

- Specific instructions, including sample location maps
- Bulk Sample Data Sheet(s) (Attachment 2 1)
- Sample Photo Data Cards (Attachment 2 2)
- Labels (Attachment 2 3)
- Chain of Custody
- Job Briefing sheet for sampling personnel

Initial Classification

Areas will be classified as suspect or non-suspect for characterization purposes by utilizing the following criteria

Suspect These are components where lead and/or metals have been identified, through historical research of building records or by visual inspection techniques, to exist in paint, fragments or dust

High Probability Locations For Lead And Metals

- Wall and ceiling paint
- Paint on components (i e, guard rails, tanks, machine guards)
- Gloveboxes and associated shielding equipment
- Piping
- Roof jacks
- Mounting plates and bracket bars
- Stationary shields
- Lead fill in walls
- Plaster additives

Non-Suspect These are areas where there is a high level of certainty that lead and/or metals do not exist due to their absence in paint, chips, dust, fragments or other material forms

SURVEY PROCEDURE

Sampling for lead and metals will be primarily performed utilizing a dust sampling technique and a paint scraping techniques The paint scraping technique is the preferred method for sampling when possible as the exact location of the lead or metal can be identified precisely With dust sampling, the sample may yield indications from many locations Each sample will be acquired with the intent of assuring the quality, representation and safety of the process Please note that when required, a RCT will be present to survey the area and location of the sample prior to proceeding

Settled Dust Sampling

Settled dust sampling is used as an aid to assessment of Industrial Hygiene issues such as work practices and engineering controls and P P E The general guidelines to perform settled dust sampling are

Supplies Required.

- One Micro-Vac Sampler pump calibrated at 2 l p m
- One template that sequesters a 10 sq inch pattern
- One 25 m m cassette attached to the Micro Vac Sampler
- A two inch section of tygon tubing
- Labels, sharpie and sampling logs
- Chain of custody form
- Camera (Optional)
- Attachments 2 1, 2 2 & 2 3 of this protocol)

Sampling Technique·

- Place template on area to be sampled
- Slowly vacuum all surface areas inside of template with tygon hose which is attached to the Micro-Pump (Change tubing and cassette for each sample)
- Label the cassette with identifying number and seal
- Document sample location and description on Chain of Custody form
- Photograph sample identification area with photo identification card (Optional)
- Complete attachments 2 1, 2 2 & 2 3 of this protocol

Paint Chip Sampling

Paint chip sampling is used as an aid to assessment of Industrial Hygiene issues such as work practices and engineering controls and P P E The general guidelines to perform paint chip sampling are

Special Note Ensure that the location of paint sampling is cleaned before samples are obtained to minimize the prospect of cross-contamination Paint chip sampling is a destructive method that may release a small quantity of lead dust Therefore, proper safety precautions must be taken to ensure protection of the sampler and prevent the spread of suspect materials It is also important to ensure that before any paint sampling occurs, the proper method of containment must be utilized

Containment Methods When Procuring Paint Samples

Method One: Paint Chip Sampling Utilizing Plastic Sheeting

Procure and place a clean sheet of plastic, large enough to capture all the sample material in the area to be sampled to capture the paint chips Any visible paint chips falling onto the

plastic shall be included in the sample Thoroughly clean or dispose of the plastic after each sample is collected by placing the sheeting in a trash bag

Method Two Paint Chip Sampling Utilizing Glovebag Approach

If further containment is deemed necessary, a "glovebag" approach may be used A durable sheet of plastic is loosely taped to the surface to be sampled, with a paint scraper, collection device, and shipment container housed inside the plastic There should be enough "play" in the plastic to permit a scraping motion without dislodging the tape holding the plastic to the surface Large plastic baggies can be used in lieu of the sheet of plastic if paint chips are to be shipped to the lab in plastic baggies Properly conducted, this method completely seals the surface during the actual scraping operation A sheet of plastic is recommended for use under the glove bag to capture any debris that falls to the ground during the glove bag removal The tape should be slowly removed from the surface to avoid lifting any additional paint off of the surface

Supplies Required for Paint Chip Sampling.

- Sharp stainless steel paint scraper
- Disposable wipes for cleaning paint scraper
- Non-sterilized, non-powdered, disposable gloves
- Hard-shelled containers, that can be rinsed, for paint chip samples if results are to be reported in ug/g or percent by weight
- Collection device (clean creased piece of paper or cleanable tray)
- Field sampling and laboratory submittal forms
- Tape measure or template (if results are reported in mg/cm^2)
- Ladder
- Plastic trash bags
- Flashlight
- Adhesive tape

Paint Sample Collection

- Template / measure area to be sampled precisely (Area must be 4 square inches in size and must have a minimum weight of 0 2 grams, sample size maybe adjusted with IH&S approval)

Special Notes: Person collecting paint chips samples shall wear latex gloves for each sample

If analysis results are reported in mg/cm^2 or mg/kg, including a small amount of substrate in the sample is permitted

Utilizing a razor sharp chisel or scraper and hammer, scrape paint sample directly off the substrate surface and/ or sampling surface (Ensure to remove all layers of the paint equally but none of the substrate)

- Place the sample in an approved container for shipment
- Record the exact location, dimension, description of paint color and substrate component on the field sampling form and the chain of custody form

Composite Paint Chip Sample Collection

When it is not possible to collect the required size sample at one location, a composite sample may be collected

Paint chip samples may be composited by collecting individual subsamples from different areas but similar surfaces Each subsample should be the same size and weight No more than five subsamples shall be included in the same sample container or ziplock baggie

Cleanup and Repair

- All settled dust generated should be cleaned up using wet wipes
- The surface may be resealed with new paint if necessary If desired, apply spackling and/or new paint to repair the area where paint was removed
- Personnel conducting paint sampling shall avoid hand-to-mouth contact (specifically, smoking, eating, drinking, and applying cosmetics) and shall wash their hands with running water immediately after sampling

Preparing Sample for Transfer to Lab

The samples shall be submitted to a laboratory recognized by the EPA National Lead Laboratory Accreditation Program Appropriate sample submittal forms shall be used The field sample number shall appear on the field sampling form, the laboratory submittal form, and the container label The name of the laboratory, the date the samples were sent to the lab, and all personnel handling the sample from the time of collection to the time of arrival at the laboratory shall be recorded on a chain of custody form

2 1 Bulk Sample Data Sheet

Job# _____Name _____Date _____

General Description of building/area _____

Sample Number	Sample Description And Location	Lab

2 2 Sample Photo Data Card

BUILDING_____**ROOM** _____ **DATE**_____

SAMPLE NUMBER· _____

2.3 Labels

779-970108-MS-001	779-970108-MS-001	779-970108-MS-001
779-970108-MS-002	779-970108-MS-002	779-970108-MS-002
779-970108-MS-003	779-970108-MS-003	779-970108-MS-003
779-970108-MS-004	779-970108-MS-004	779-970108-MS-004
779-970108-MS-005	779-970108-MS-005	779-970108-MS-005
779-970108-MS-006	779-970108-MS-006	779-970108-MS-006
779-970108-MS-007	779-970108-MS-007	779-970108-MS-007
779-970108-MS-008	779-970108-MS-008	779-970108-MS-008
779-970108-MS-009	779-970108-MS-009	779-970108-MS-009
779-970108-MS-0010	779-970108-MS-0010	779-970108-MS-0010
779-970108-MS-0011	779-970108-MS-0011	779-970108-MS-0011
779-970108-MS-0012	779-970108-MS-0012	779-970108-MS-0012
779-970108-MS-0013	779-970108-MS-0013	779-970108-MS-0013
779-970108-MS-0014	779-970108-MS-0014	779-970108-MS-0014
779-970108-MS-0015	779-970108-MS-0015	779-970108-MS-0015
779-970108-MS-0016	779-970108-MS-0016	779-970108-MS-0016
779-970108-MS-0017	779-970108-MS-0017	779-970108-MS-0017
779-970108-MS-0018	779-970108-MS-0018	779-970108-MS-0018
779-970108-MS-0019	779-970108-MS-0019	779-970108-MS-0019
779-970108-MS-0020	779-970108-MS-0020	779-970108-MS-0020
779-970108-MS-0021	779-970108-MS-0021	779-970108-MS-0021
779-970108-MS-0022	779-970108-MS-0022	779-970108-MS-0022

Attachment 3.0

Asbestos Characterization

Protocol

ASBESTOS CHARACTERIZATION PROTOCOL

Introduction

This protocol describes how to perform asbestos surveys The criteria outlined are specifically designed to provide occupational hazard assessment information in support of decommissioning activities while performing asbestos activities However, in some cases the results, particularly those from locations not affected by asbestos operations, may be used as final status results or to support a final survey

No activity that may cause asbestos to become airborne will be authorized, without the proper personal protective equipment and controls, until smear sampling demonstrates that the area is below the plant housekeeping limit

Purpose

The purpose of this protocol is to provide guidelines for the sampling analysis of asbestos Although asbestos sampling instructions will be completed by a Colorado State Certified Inspector, the protocol can be used to help understand the sampling requirements

This approach is consistent with the most conservative information available, and ensures compliance with applicable federal and state regulations

Instruction Development

This protocol serves as a guide in the preparation of specific instructions to obtain all of the answers to the questions referenced in Section 5 0 of this protocol Additionally the instructions should contain

- Specific instructions, including sample location maps
- Asbestos Inventory Worksheet (Attachment 3 1)
- Asbestos Inspection Checklist (Attachment 3 2)
- Bulk Sample Data Sheet (Attachment 3 3)
- Photo Data Card (Attachment 3 4)
- Labels (Attachment 3 5)
- Chain of Custody
- Job Briefing Sheet for Sampling Personnel

The survey practices outlined in this protocol are specifically designed to provide occupational hazard assessment information in support of decommissioning activities within buildings However, the information may be used to provide support for a comprehensive operation and maintenance program during normal building activities

Initial Classification and Survey Procedures

The first step in sampling for asbestos in a building is to research the building records such as blueprints and specifications for documentation of the use of asbestos Dates of construction are considered in this process In addition to building materials, certain process equipment may have used asbestos as an insulator or protective covering, and this use must be verified through research

The second step in this process is to physically tour the building, entering every accessible area and room, looking for affected materials that may indicate, through historical data, or based on the inspector's experience, the presence of asbestos A listing of suspect materials and areas is generated, along with estimated quantities Non-suspect (or unaffected) materials are those traditionally made of wood, glass or metal However, the inspector will suspect the adhesives applied to secure non-suspect materials to the substrate Suspect, or affected materials are separated into three general categories Thermal Systems Insulation, Surfacing Materials, and Miscellaneous Materials Data compilation will separate the materials into homogeneous areas within these three general categories, which will lead to the number of samples necessary for regulatory compliance and statistical reliability of the outcome Any homogeneous area may be assumed to contain asbestos, negating the need for samples Each building and/or construction date is sampled as a single entity

The number of samples for each homogeneous area is determined initially by its physical condition of friability, then by it's general category Friable materials are those that are capable of being crumbled or reduced to powder by hand pressure Thermal systems insulation, such as that found on pipes or ducts, friable or non-friable, require a minimum of three samples per homogeneous area, one sample from patches less than six linear or square feet, and one from cementitious or "mudded" fittings Each mechanical system, such as hot and cold domestic water, may have several homogeneous areas Each must be sampled accordingly Friable surfacing materials, such as fireproofing or ceiling texture, must have a nine section grid applied to a blueprint of the area and samples must be acquired from the center of randomly selected areas within the grids If the homogeneous area of friable surfacing material is less than 1000 square feet, three samples are needed, if between 1000 and 5000 square feet, five samples are needed, if the area is over 5000 square feet, seven samples are needed Miscellaneous materials, such as floor and ceiling tiles, are sampled according to the inspector's discretion A minimum of one sample of each suspected material in this category will be acquired

Sample locations are selected randomly according to how each represents a homogeneous material Since homogeneous areas are located throughout the building, the representation and number of samples are the driving factors rather than exact location of the sample in each room Exact locations are directly affected by the radiological concerns A Radiological Control Technician will accompany the inspector If a selected location is determined to exceed acceptable parameters, a second location is selected Should no radiologically acceptable location be found, a contaminated sample is acquired and treated accordingly

Sampling Methodology

Each sample is acquired with the intent of assuring the quality of the sample, representation of the sample, and safety of the sampler Note that a RCT will be present as necessary to survey the area and location of the sample prior to obtaining the sample The following steps will be performed for each sample acquired

- The location of the sample is visually verified against written descriptions
- A polyethylene drop cloth or a baggie is secured below the sample areas above the floors
- The immediate sample area is wetted with a mist of water and surfactant
- A sampling tool, such as a hammer and chisel, razor knife, "Wondermaker" or hole saw is selected and the sample is acquired, making sure to take a complete sample from the substrate Each sample must be a minimum of one cubic centimeter and no more than that necessary to be representative of the suspect material During this process, the immediate surface is misted as needed to preclude drying
- The acquired sample is placed in a sealable container, such as a plastic bag or vial

- The container is sealed and a pre-numbered label is placed on the container The sample number label is placed on chain of custody papers and the container is verified to be sealed
- The sampling tool is thoroughly cleaned using the mister and wipes
- The sample area is patched as needed
- The description and location is documented on a form (Appendix 3 3), a sample label is placed on the form, and the location is documented on a blueprint or other suitable drawing
- The sample container, drop cloth and immediate sample area is wet, wiped, and the drop cloth is carefully folded in to the center and placed in a sealable bag and the bag is sealed
- In the case of routine maintenance areas, a pre-numbered label is placed at the sample location With permission of the Building Manager, labels will be placed on all sample locations
- The sample location is photographed with a sample photo identification card in the focus area documenting the sample number and date, and orienting the viewer to the location with an arrow
- All spent wipes, drop cloths, and PPE will be added to the appropriate waste stream

3 1 ACM Inventory Worksheet

Building Number_____Room Number _____ Date _____

TSI INVENTORY

Pipe Type _____ Linear/sq ft _____ Fitting count
Type _____ Linear/sq ft _____ Fitting count
Type _____ Linear/sq ft _____ Fitting count
Type _____ Linear/sq ft _____ Fitting count
Type _____ Linear/sq ft _____ Fitting count

Duct Type _____ Duct Size/app _____ Sq ft _____
Duct Type _____ Duct Size/app _____ Sq ft _____

Other _____

_____

SURFACE INVENTORY·

Location _____ Description _____ Sq ft _____
Location _____ Description _____ Sq ft _____
Location _____ Description _____ Sq ft _____
Location _____ Description _____ Sq ft _____

MISCELLANEOUS INVENTORY:

Location _____ Description _____ Sq /lin ft _____
Location _____ Description _____ Sq /lin ft _____
Location _____ Description _____ Sq /lin ft _____
Location _____ Description _____ Sq /lin ft _____
Location _____ Description _____ Sq /lin ft _____
Location _____ Description _____ Sq /lin ft _____

3.2 Rocky Flats Plant Asbestos Containing Material Inspection Check List

1 Inspector _____ Signature_____Accreditation# _____ State_____
Date _____

2 BUILDING NO
BLDG AREA CODE

- ☐ 1 1st Floor
- ☐ 2 2nd Floor
- ☐ 3 3rd Floor
- ☐ 4 4th Floor
- ☐ 5 Basement
- ☐ 6 Crawl Space
- ☐ 7 Roof
- ☐ 8 Exterior of BLDG
- ☐ 9 Plenum
- ☐ 10 Other

3 ROOM NUMBER
COLUMN NUMBERS

4 SPECIFIC LOCATION

5 % FUNCTIONAL SPACE

6 FUNCTIONAL SPACE I D
HOMOGENEOUS AREA I D

7 MATERIAL TYPE CATEGORY

- ☐ T Thermal System Insulation
- ☐ S Surfacing Material
- ☐ M Miscellaneous Material

8 1 TSI ACM
PIPE LENGTH (FT) _____
8 2 TSI ACM
PIPE LENGTH (IN) _____
8 3 TSI ACM
PIPE WITH INSULATION DIAMETER (IN)
8 4 SURFACING MISC ACM
8 5 TOTAL SURFACE MATERIAL (SQ FT)
_____
8 6 SURFACING/MISC ACM
DEPTH OF SURFACE MATERIAL (IN)
_____

9 1 FUNCTION CODE

- ☐ 1 Acoustic Insulation
- ☐ 2 Baseboard Board
- ☐ 3 Boiler/Furnace Insulation Damper
- ☐ 4 Caulking Mat'l
- ☐ 5 Ceiling Tile Insulation
- ☐ 6 Chilled Water Pipe
- ☐ 29 Tank
- ☐ 30 Transite
- ☐ 31 Vibration
- ☐ 32 Wall Board
- ☐ 33 Wall
- ☐ 34 Wall Plaster/Spackle
- ☐ 7 Chilled Water Pipe Fitting
- ☐ 35 Other _____
- ☐ 8 Cold Water Piping
- ☐ 9 Cold Water Pipe Fitting
- ☐ 10 Condensate Pipe
- ☐ 11 Condensate Pipe Fitting
- ☐ 12 Cooling Tower Baffles
- ☐ 13 Debris/Settled Dust
- ☐ 14 Domestic Cold Water Pipe
- ☐ 15 Domestic Cold Water Fitting
- ☐ 16 Door
- ☐ 17 Drain Pipe
- ☐ 18 Drain Insulation
- ☐ 19 Exterior Construction
- ☐ 20 Floor Tile
- ☐ 21 Fire Stop
- ☐ 22 fire Proofing Insulation
- ☐ 23 High Temp, Water Pipe
- ☐ 24 High Temp Water Pipe Fitting
- ☐ 25 Mastic Adhesive
- ☐ 26 Roofing
- ☐ 27 Steam Pipe
- ☐ 28 Steam Pipe Fitting

9 2 ASBESTOS FORM CODE

- ☐ 1 Air Cell
- ☐ 2 Blanket
- 3 Block
- ☐ 4 Cloth
- ☐
- ☐ 5 Loose Fill
- ☐ 6 Pre-formed
- ☐ 7 Sheet
- ☐ 8 Sprayed On
- ☐ 9 Troweled On
- ☐ 10 Other _____

9 3 COLOR CODE

- ☐ 1 B Blue
- ☐ 2 BL Black
- ☐ 3 BR Brown
- ☐ 4 G Green
- ☐ 5 GR Gray
- ☐ 6 O Orange
- ☐ 7 W White
- ☐ 8 Y Yellow
- ☐ 9 Other _____

10 CONSISTENCY

- ☐ Brittle - hard
- ☐ Semi - Solid
- ☐ Fibrous - loose
- ☐ Granular - Pliable

11 CURRENTLY FRIABLE

☐ Yes ☐ No

12 CAUSE OF DAMAGE

☐ 1 Area Usage
☐ 2 Vibration
☐ 3 Air Flow
☐ 4 Water Damage
☐ 5 Service Activity
☐ 6 Usual Aging
☐ 7 Other _____

13 CONTAMINANT PRESENT

☐ 0 None
☐ 1 Spotty
☐ 2 Widely Scattered
☐ 3 Entire Area

14 DISPERSAL FACTOR

☐ 1 Water
☐ 2 Air
☐ 3 Occupant
☐ 4 Machinery

15 AREA USED BY

☐ Maintenance Workers
☐ Operations Workers
☐ Administrative Personnel
☐ Visiting Public

3.3 Bulk Sample Data Sheet

Job# _____ Name_____ Date_____

General Description of building/area

_____

Sample Number	Sample Description And Location	Lab

3.4 Sample Photo Data Card

BUILDING_____ROOM _____ DATE _____

SAMPLE NUMBER. _____

3 5 Labels

779-970108-MS-001	779-970108-MS-0023	779-970108-MS-0045
779-970108-MS-002	779-970108-MS-0024	779-970108-MS-0046
779-970108-MS-003	779-970108-MS-0025	779-970108-MS-0047
779-970108-MS-004	779-970108-MS-0026	779-970108-MS-0048
779-970108-MS-005	779-970108-MS-0027	779-970108-MS-0049
779-970108-MS-006	779-970108-MS-0028	779-970108-MS-0050
779-970108-MS-007	779-970108-MS-0029	779-970108-MS-0051
779-970108-MS-008	779-970108-MS-0030	779-970108-MS-0052
779-970108-MS-009	779-970108-MS-0031	779-970108-MS-0053
779-970108-MS-0010	779-970108-MS-0032	779-970108-MS-0054
779-970108-MS-0011	779-970108-MS-0033	779-970108-MS-0055
779-970108-MS-0012	779-970108-MS-0034	779-970108-MS-0056
779-970108-MS-0013	779-970108-MS-0035	779-970108-MS-0057
779-970108-MS-0014	779-970108-MS-0036	779-970108-MS-0058
779-970108-MS-0015	779-970108-MS-0037	779-970108-MS-0059
779-970108-MS-0016	779-970108-MS-0038	779-970108-MS-0060
779-970108-MS-0017	779-970108-MS-0039	779-970108-MS-0061
779-970108-MS-0018	779-970108-MS-0040	779-970108-MS-0062
779-970108-MS-0019	779-970108-MS-0041	779-970108-MS-0062
779-970108-MS-0020	779-970108-MS-0042	779-970108-MS-0063
779-970108-MS-0021	779-970108-MS-0043	779-970108-MS-0064
779-970108-MS-0022	779-970108-MS-0044	779-970108-MS-0065

Attachment 4.0

Chemical and Liquids Characterization Protocol

CHEMICAL AND LIQUIDS CHARACTERIZATION PROTOCOL

Introduction

This protocol describes how to perform chemical & liquid surveys The criteria outlined are specifically designed to provide occupational hazard assessment information in support of decommissioning activities If the systems sampled are closed loop and no chance exist that foreign or new materials may enter the systems, then results will be used to support final survey results and reporting

The purpose of this document is to describe the protocol for sampling of chemicals and liquids within the facility to be decommissioned or characterized

Purpose

The purpose of this protocol is to provide a consistent approach to the sampling and analysis of liquid materials

The survey practices outlined are designed to provide information to be used in support of decommissioning activities within a facility However, in some cases the results, particularly those from locations not affected by chemical and liquid continuous operations (i e , closed loop) may be used as final status results or to support a final survey

Instruction Development

This protocol serves as a guide in the preparation of specific instructions to obtain all of the answers to the questions referenced in Section 5 0 of this protocol Additionally the instructions should contain facility drawings, photographs and facility walk-downs to provide detailed information to assist the project engineer in making determinations as to where sampling should be conducted

Initial Classification

In an effort to provide an organized approach to the characterization activities, rooms are identified as being in one of two classifications, affected and unaffected These classifications aid in focusing the sampling effort at the areas with a higher potential of contaminants

Affected areas For the purpose of liquids sampling, are defined as those rooms that have had a history of containing liquids and chemicals to include the presence of equipment containing reservoirs (i e , machining lathes, etc), process lines, piping, tanks, containers, sinks, sumps and any other vessel likely to contain liquids or chemicals Facility drawings, photographs and facility walk-downs provide detailed information to assist the project engineer in making determinations as to where sampling should be conducted

Unaffected areas Are defined as areas or rooms where there is no history or process knowledge of liquids or chemicals being present, or which have been verified through visual inspection as being empty, and containing no chemical residues or liquids Examples of such rooms would include hallways, closets and office areas which have no visible reservoirs or piping systems associated with them, and have no container storage facilities In some cases, rooms may be classified as unaffected based on visual inspections which confirm all liquid sources to be empty or absent

Data Collection

Upon initial classification as an unaffected or affected area, a facility walk-down of the area or room is conducted in an effort to visually identify those items that require sampling A sampling request is then completed and forwarded to the Analytical Projects Office (APO) for each room and equipment item to be sampled and the APO coordinates with the project engineer to arrange for the sampling event

Data collected during the characterization activities will consist of two types

(1) Field measurements using portable instruments or test kits (i e , pH paper) and

(2) Sample analyses of media using fixed laboratory equipment or systems

Radiological surveys will be performed by trained Radiological Control Technicians (RCTs) using field instrumentation in accordance with Radiological Operations Instructions during sampling activities, as necessary Radiation protection associated with the sampling event and the sampling team will be addressed under a Radiological Work Permit (RWP) Additional personal protective equipment for the sampling activity, if required, will be as specified by Industrial Hygiene support personnel

A trained sampling team is used to perform the sampling activities required for characterization purposes Analysis for characterization purposes will be performed using Environmental Protection Agency (EPA) approved procedures, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, U S EPA SW-846, 1986, Third Edition using laboratory facilities located on-site

During characterization activities, several direct, indirect and media samples will be, obtained and analyzed for radiological and hazardous material contaminants The results will be used to qualify and quantify contaminants and is the basis for estimating waste quantities and decontamination options Sample collection, analysis, and the associated documentation will follow site procedures which meet the recommendations and requirements of applicable regulatory agencies A "chain of custody" sample tracking form is used for each sample collected to account for the sample from collection to the point of analysis Samples will be collected and documented in accordance with Laboratory Procedure No L-6294-A, *Sampling Within an RBA/CA*, for P A work and L-6245-F, Sampling procedure for Waste Characterization on the "cold side", non P A work

Attachment 5.0

Decommissioning

Polychlorinated Biphenyls (PCBs)

Protocol

SAMPLING PROTOCOL FOR POLYCHLORINATED BIPHENYLS (PCBs)

Introduction

This protocol describes how to perform PCB characterization surveys The criteria outlined are specifically designed to provide PCB occupational hazard assessment information in support of decommissioning activities while performing PCB work activities

No activity that may cause PCB materials to become spilled or spread will be authorized, without the proper personal protective equipment and controls, until PCB sampling demonstrates that the area is below the permissible limits for working in areas with PCBs that are controlled and securely contained

Purpose

The purpose of this protocol is to provide a consistent approach for the identification and analysis of materials potentially containing PCBs

The survey practices outlined are specifically designed to provide occupational hazard assessment information in support of decommissioning activities within a facility However, in some cases the results, particularly those from locations not affected by new introductions of PCBS (i e , closed loop) may be used as final status results or to support a final survey

Instruction Development

This protocol serves as a guide in the preparation of specific instructions to obtain all of the answers to the questions referenced in Section 6 0 of this protocol Additionally the instructions should contain

- How to quantify the physical and chemical characteristics of PCB contamination and determine the extent of PCB contaminant distribution in an affected area
- How to quantify and qualify environmental parameters that affect potential human exposure from existing and residual PCB material contamination
- How to identify PCB containing materials based on historical and industrial data
- How to identify the limited conditions for sampling
- Facility drawings, photographs and facility walk-downs to provide detailed information to assist the project engineer in making determinations as to where sampling should be conducted

Initial Classifications

All areas of facilities or buildings do not have the same potential for PCB contamination and therefore do not require the same level of characterization survey coverage to determine the initial classification
By reviewing RFETS historical data and PCB industry equipment records, an effective and efficient characterization process will be conducted

Two classifications of survey areas will be used when determining PCB survey requirements These are affected and unaffected areas These are defined as follows

Affected areas These are areas that have potential PCB contamination (based on historical reviews) or known PCB contamination (based on past or preliminary RFETS and industry surveillance) This would normally include materials such as

- Transformers
- Fluorescent light ballasts
- Paints (Prior to 1980)
- Electrical wiring)
- Oils & Paints
- Gaskets in HVAC system

Areas immediately surrounding or adjacent to locations where PCB containing materials were used or stored, spilled, or buried are included in this classification because of the potential for inadvertent spread of contamination

Unaffected areas All areas not classified as affected will be labeled unaffected These areas are not expected to contain residual PCBs, based on a knowledge of site history and previous RFETS and industrial information concerning PCBs

Sampling Methodology

NOTE. For actual sampling activities refer to procedures L-6294-A and L-6245-F to perform sampling activities

Data collected during the characterization activities will consist of two types

(1) Collection of field swipes taken from PCB-suspect items and

NOTE. It is important to note that a minimum of five grams of media is required to perform the PCB solids analysis

(2) Sample analyses of media (paint chips, liquids, etc) using laboratory equipment or systems

Before performing sampling activities the following measures must be evaluated

- Method of collection and sampling equipment required
- Bottle/equipment decontamination and disposal
- Field and measuring equipment required
- Sampling parameters
- Sample collection, bottling & preservation
- Sample disposal
- Chain of custody requirements

Sampling Equipment Required

- Watch
- Field sampling requests
- Pager and/or radio
- Hearing protection
- Coolers
- Ice packs
- Squeeze bottles
- Various tools, screwdriver, scissors, hammer, bung drum wrench
- Flashlight
- Sampling logbook
- Spray bottles

Sampling Activities.

Radiological surveys will be performed by trained Radiological Control Technicians (RCTs) using field instrumentation in accordance with Radiological Operations Instructions during sampling activities, as necessary

A trained sampling team is used to perform the sampling activities Analysis for characterization purposes will be performed using Environmental Protection Agency (EPA) approved procedures identified in, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, U S EPA SW-846, 1986, Third Edition Laboratory facilities located on-site or off site will support the analysis Onsite methods for analysis of PCBs includes SW-846 Method 8081 "GC Analysis for PCBs in oils and solids Off-site methods include SW-846 Method 8080A A table describing the differences in these methods is included in Appendix A Data Quality Objectives (DQOs) are established for the analytical methods referenced and are available through the on-site Kaiser-Hill APO office in B-881 DQOs for offsite laboratories are established under individual QA/QC Programs which meet the intent of EPA SW-846 requirements

During characterization activities, several direct, indirect and media samples will be, obtained and analyzed for radiological (as needed) and PCB contaminants The results will be used to determine contaminants and as the basis for estimating waste quantities and decontamination options Sample collection, analysis, and the associated documentation will follow site procedures which meet the recommendations and requirements of applicable regulatory agencies A "chain of custody" sample tracking form is used for each sample collected to account for the sample from collection to the point of analysis Samples will be collected and documented in accordance with Laboratory Procedure No L-6294-A, *Sampling Within an RBA/CA*

Analysis Methodology

Specialized procedures have been developed at RFETS to meet technical requirements for analyzing certain substances, such as those containing radionuclides or compounds which interfere with the accuracy and precision of the analysis These test methods are entitled the "L-Procedures " "L- Procedures" are based on test methods found in 6 CCR, 1007-3, Part 261, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, U S EPA SW-846, 1986, Third Edition, as amended by Updates I (July 1992), II (September, 1994), and IIA (August 1993), *Methods for Chemical Analysis of Water and Wastes*, EPA Publication No 600/4-79-020 (1979) Various other EPA approved protocols such as those from the American Society of Testing and Materials (ASTM) are also used

Analysis for hazardous waste determination is conducted in accordance with Rocky Flats Site Procedure 1-C75-HWRM-03, *Waste Identification and Analysis* This document outlines and references requirements of waste management for liquids which will be handled as waste material This document contains the guidelines used at RFETS to determine if a waste is regulated as hazardous under RCRA, and to identify the waste characteristics/constituents for proper management of the waste

Quality Assurance

The Quality Assurance Program for characterization activities follows the same program for management of hazardous wastes on-site and meets the minimum requirements established by *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, U S EPA SW-846, 1986, Third Edition QA/QC procedures addressing waste characterization are maintained at the site

Data Analysis And Review

As specified in 40 CFR 761 60(4), disposal of solid PCBs is regulated at concentrations of 50 ppm or greater in the form of contaminated soil, rags or other debris Processing or distribution in commerce of any PCB or PCB item, regardless of concentration, that is not specifically authorized is prohibited The limit of detection for distribution in commerce is 2 ppm This applies to the resale, reuse, or recycling of materials such as equipment that have painted surfaces with PCBs

Results of all characterization activities will be documented in field notebooks and summarized in a characterization report This characterization report will be distributed to appropriate project personnel to support decisions made for waste management, industrial hygiene, decontamination and other activities which may involve hazardous and radiological contaminants The inventory of materials and the characterization results will be provided to the Industrial Hygiene and Safety (IH & S) group for hazard review IH&S will determine if controls or personal protective equipment will be required during Decommissioning activities and provide recommendations during work package development

Sample results for liquid wastes generated are submitted to the building Environmental Coordinator (EC) and/or the project Waste Specialists in order to prepare for waste disposal

Attachment 6.0

Radiological Characterization

Protocol

RADIOLOGICAL CHARACTERIZATION PROTOCOL FOR BUILDING AND STRUCTURES

Introduction

This protocol describes how to perform radiological characterization surveys The criteria outlined are specifically designed to provide radiological occupational hazard assessment information in support of decommissioning activities while performing radiological work activities

No activity that may cause radioactive materials to become airborne will be authorized, without the proper personal protective equipment and controls, until smear, fixed and scan sampling demonstrates that the area is below the permissible limits for working in radiologically controlled areas

Purpose and Objectives

The purpose of this protocol is to provide guidelines for the radiological sampling of buildings, structures and environs for characterization purposes

This approach is consistent with the most conservative information available, and ensures compliance with applicable federal, state and site regulations and requirements

Instruction Development

This protocol serves as a guide in the preparation of specific instructions to obtain all of the answers to the questions referenced in Section 5 0 of this protocol Additionally the instructions should contain

Before starting the actual characterization activities a historical profile must be developed to support the instruction development process This process will include

(1) A review of operating history of the facility or building with respect to use, spills, releases and any other significant radiological events

(2) Review of radiological data from past scoping and characterization surveys

(3) Identification of radionuclides of concern and determine guidelines

(4) Classification of areas as to "affected" and "unaffected"

Initial Classification

All areas of facilities or buildings do not have the same potential for residual contamination and therefore do not require the same level of characterization survey coverage to determine the initial classification By combining historical data with surveillance and routine surveys, an effective and efficient characterization process will be conducted

Two classifications of survey areas will be used when determining survey requirements These are affected and unaffected areas These are defined as follows

Affected areas These are areas that have potential radioactive contamination (based on historical reviews) or known radioactive contamination (based on past or preliminary radiological surveillance) This would normally include areas where radioactive materials were used and stored, where records indicate spills or other unusual occurrences that could have resulted in spread of contamination and where radioactive materials were buried Areas immediately surrounding or adjacent to locations where radioactive materials were used or stored, spilled, or buried are included in this classification because of the potential for inadvertent spread of contamination

Unaffected areas All areas not classified as affected will be labeled unaffected These areas are not expected to contain residual radioactivity, based on a knowledge of site history and previous survey information

Survey Approach

When performing characterization surveys in affected and unaffected areas the surveys will be directed toward biased locations identified during the historical review phase Additionally random points will also be selected in non biased areas to validate previous survey data

Normally when performing characterization activities the surveys will consist of surveying structures (which consist of equipment, ceilings, walls, floors, etc), environs (surface and subsurface) and liquid pathways, if applicable Sampling guidance from NUREG/CR-5849 *Manual for Conducting Radiation Surveys In Support of License Termination* and *MARSIMMS* will be utilized as appropriate

Survey Techniques And Plans

When performing radiological surveys three main techniques will be utilized to acquire the survey data The characterization will be conducted in accordance with documented plans, instructions and procedures The survey plan or instruction will define the general approach to performing measurements and sampling Figure 5-1 provides an example of a survey instruction To determine the number of survey locations on the hood the Radiological Eng evaluates

- Size of equipment or structure
- Radiological history
- Initial classification status

The quality assurance plan establishes the basis for assuring the adequacy and quality of the survey data Specific survey techniques are detailed in procedures, which may be included in the instruction or plan or incorporated by reference Personnel (RCTs) conducting the surveys will be trained and qualified in the ROIs (Radiological Operating Instructions) procedures they use, (Radiological Operating Instructions) to perform the radiological surveys In addition to procedure training, the RCTs will be qualified per the site requirements (DOE and Site Radcon manuals, TUM manual and oral board examinations to ensure they are fully qualified RCTs Changes in plans and procedures will on occasion be necessary, based on unanticipated findings or conditions encountered as the survey progresses These changes will be reviewed and/or documented by the supervision in charge of the survey(s) and these changes will be made in accordance with the site procedure approval & revision process

Surveys will address alpha, beta, gamma and neutron emitting materials as appropriate Various types of instrumentation will be utilized However, the instrumentation normally falls into (3) categories These categories are (1) Gas filled detectors, (2) Scintillation detectors, and (3) Solid state detectors

The design and the conditions under which a specific detector is operated determines the types of radiations (alpha, beta and/or gamma) that can measured, the sensitivity level for measurements and the ability of the detector both to differentiate between different types of radiation and distinguish between the energies of the interacting radiations The particular capabilities of a radiation detector will, in turn, establish its potential applications in conducting a survey for final site release A listing of alpha, beta, and gamma radiation detector types along with their usual applications are listed in Attachments 6 2 and 6 3

Survey techniques to be utilized include (3) major techniques These techniques include

Scan surveys Scan surveys are conducted by holding the detector as close as possible to a surface and moving the detector across the surface at a slow speed, (about one detector width per second) Nominally the distance between the detector and the surface is maintained at less than 2 centimeters with the exception of alpha scanning for which the distance should be less than 1 centimeter

Fixed point surveys or Direct measurements Fixed point surveys are conducted by holding a detector as close as possible to a surface for a prespecified period of time Normally this is a integrated count for one minute using a (100 cm^2) detector which has the required sensitivities to measure below the guideline values

Removable contamination measurements Smears for removable surface activity are obtained by wiping an area of approximately 100 cm^2 using a dry filter paper, such as a Whatman 50 or equivalent, while applying a moderate pressure Normally a smear is taken at each direct measurement location, although for characterization purposes it is not always required Large area wipes or "masslin smears" can be utilized during scoping and characterization surveys

Sampling for soil, water or other liquids are outside the scope of this protocol

Laboratory Sample Analysis

Samples collected during characterization will be analyzed by trained individuals using the appropriate equipment and procedures Samples may be analyzed on or off site, however, there must be written procedures that document the laboratory's analytical capabilities for the radionuclides of interest and a QA/QC program which assures validity of the analytical results An example of equipment sensitivities for laboratory radiometric equipment/procedures to analyze characterization surveys are found in Appendix 6 4

Survey Documentation

As surveys are completed they will be documented and forwarded to the Radiological Foreman and Engineer for review and approval Surveys generated will be controlled by the site record storage and retrieval program and they will be considered quality records

Attachment 6.1
Example
Building 779 Decommissioning Project
Characterization Instruction Sheet

Location/Room. 150

	Radiological Survey(2)			
Item/Area[1] Description	**# of Swipes[3] (Alpha Beta)**	**# of Direct Measurements (Alpha/Beta)**	**# Be Swipes[4]**	**Special Instructions**
Work Table w/Hood	5	5	3	Obtain measurements on suspected contaminated surfaces
Motor Generator Set	5	5	1	Obtain measurements on external equipment surfaces and points where contamination is potentially present

Notes

1	See Attached Map of Room And Component Layout
2	Surveys To Be Performed In Accordance With 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*
3	Large Area Wipe Technique May Be Used As Deemed Appropriate
4	When Possible Use Radiological Swipes For Be Survey Requirements

Review And Approval

Prepared By _____ Date _____

Rad Engineer _____ Date _____

6.2 Radiation Detectors with Applications to Alpha Surveys

Detector Type	Detector Description	Application	Remarks
gas proportional	< 1mg/cm^2 window, probe face area 50 to 100cm^2 < 0 1 mg/cm^2 window, probe face area 10 to 20 cm^2 no window (internal proportional), Probe face area 10 to 20 cm^2	surface scanning, surface activity measurement, field evaluation of smears laboratory measurement of water, air and smear samples laboratory measurement of water, air and smear samples	
scintillation	ZnS(Ag) scintillator, probe face area 50 to 100 cm^2 ZnS(Ag) scintillator, probe face area 10 to 20 cm^2 Lucas scintillation flask	surface scanning, surface activity measurement, field evaluation of smears laboratory measurement of water, air and smear samples laboratory measurement for low levels of radium	
solid state	silicon surface barrier detector	laboratory analysis by alpha spectroscopy	

6.3 Radiation Detectors with Applications to Beta/Gamma Surveys

Detector Type	Detector Description	Application	Remarks
gas proportional	< 1mg/cm^2 window, probe face area 50 to 1000 cm^2	surface scanning, surface activity measurement, field evaluation of smears	
	< 0 1 mg/cm^2 window, probe face area 10 to 20 cm^2	laboratory measurement of water, air and smear samples	better measurement sensitivity for low energy
	no window (internal proportional), Probe face area 10 to 20 cm^2	laboratory measurement of water, air and smear samples	beta particles than detectors with windows
Geiger-Mueller	1 4 mg/cm^2 window, probe area 10 to 100cm^2	surface scanning, surface activity measurement, laboratory measurement of samples	
	various window thickness, few cm^2 probe face	special scanning applications laboratory	
scintillation	liquid scintillation cocktail containing sample	laboratory analysis, spectrum analysis capabilities	

6.4 Typical Measurement Sensitivities for Laboratory Radiometric Procedures Associated with Characterization Surveys

Sample Type	Radionuclides or Radiation Measured	Procedure	Approximate Measurement Sensitivity
Smears (filter paper)	Gross Alpha	Low-background gas proportional counter, 5-min count Alpha scintillation detector with scaler, 5-min count	5 dpm 20 dpm
	Gross Beta	Low background gas proportional counter, 5-min count End window GM with scaler, 5-min in count (unshielded detector)	10 dpm 80 dpm
	Low Energy Beta (H^{-3}, C^{-14}, Ni^{-63})	Liquid scintillation B Counter, 5-min count	30 dpm
Soil Sediment	Cs^{-137}, Co^{-60}, Ra^{-226}, (Bi^{-214})*, TH^{-232} (Ac^{-228})*, U^{-235}	Gamma Spectrometry - Intrinsic germanium detector (25% relative efficiency), pulse height analyzer, 500-g sample, 15-min analysis	1-3 pCi/g
	$U^{-234, 235, 238}$, $Pu^{-328, 239/240}$, $Th^{-228, 230, 232}$, other alpha emitters	Alpha spectrometry - pyrosulfate fusion and solvent extraction, surface barrier detector, pulse height analyzer, 1-g sample, 16-hour count	0 1-0 5 pCi/g
Water	Gross alpha	Low-background gas proportional counter, 100-ml sample, 200-min count	1 pCi/l
	Miscellaneous gamma emitter	Gamma spectrometry - 3 5-ml sample 16-hour count	10 pCi/l
	H^{-3}	Liquid scintillation spectrometry, 5-ml sample, 30 min count	300 pCi/l

Attachment 7.0

Final Radiation Survey and Site Release Protocol

FINAL RADIATION SURVEY AND SITE RELEASE PROTOCOL

Final Survey Overview

The purpose of the final decommissioning radiation survey will be to demonstrate the effectiveness of the decommissioning and to provide documentation that contaminated materials, structures, areas and components have been successfully removed/decontaminated to acceptable levels Demonstrating that a facility meets established release criteria requires the systematic collection of data to assess surface activity levels, direct exposure rates and radionuclide concentrations in various remaining materials If, as part of the overall facility disposition process additional environmental remediation actions are required, the final survey data collected as part of decommissioning will be used to document post decommissioning conditions and compliance with release criteria, as appropriate During the course of decommissioning, materials and equipment surveyed and found to meet unconditional release criteria will be released on an on-going basis Most decommissioning removal actions will not be the final action at a location Remedial action will follow and final release of the site will occur after the remedial action

All final radiological surveys will be conducted in accordance with approved procedures using equipment and techniques that will demonstrate the effectiveness of a particular dismantlement and/or decontamination effort Because the purpose of the final survey is to demonstrate that a facility meets the established release criteria, the survey will be performed in a manner that assures the results are accurate and that uncertainties have been adequately considered

Surveys will be performed by trained individuals who are required to follow standard written procedures and will use properly calibrated instruments which are sensitive to the suspected contaminants The custody of samples will be tracked from collection to analysis Data will be recorded in an orderly and verifiable way and reviewed for accuracy and consistency Every step of the final survey process, from training personnel to calculating and interpreting the data will be documented in a manner that lends itself to independent verification

Final Release Criteria

One of the ultimate goals of the decommissioning process is to assure that future uses of a facility will not result in individuals being exposed to unacceptable levels of radioactive materials Another goal of the decommissioning process is to assure that future use of a facility will not result in individuals being exposed to unacceptable levels of hazardous or toxic materials (e g , chemicals, asbestos, PCBs) Hazardous substances are addressed elsewhere in this document

The final release criteria for remaining building structures and materials will limit general population exposure to a total effective does equivalent (TEDE) of 15/85 mrem from the site in any single year above background This means (1) Conduct remediation so that, after completion of the remedial action, radioactive material in excess of background radiation levels shall not exceed concentrations that could cause any reasonably maximally exposed member of the public to receive, through all potential exposure pathways, an TEDE of 15 mrem from the site in any single year The 15 mrem will be calculated using exposure scenarios that are consistent with the land uses contemplated in the Vision, and (2) Determine that the remediation provides a reasonable expectation that, for 1000 years after completion of the remedial action in the event of failure of the active control measures, radioactive material in excess of background radiation levels shall not exceed concentrations that could cause any reasonably maximally exposed member of the public to receive, through all potential exposure pathways, an TEDE of 85 mrem from the site in any single year Once this EPA Site Remediation Regulation is promulgated as final, necessary modifications to applicable plans and procedures will be made to comply with the requirements of the final regulation

Residual levels of radioactive material that could be present and still assure that an individual would not exceed an acceptable radiation dose will be calculated by the analyses of various pathways and scenarios (e g , direct radiation, inhalation, ingestion) through which exposure could reasonably occur The derived levels, known as guideline values, release guidelines, or simply, guidelines, are presented in terms of direct radiation levels, surface activity levels, volume concentrations of radioactive material in soil and building materials, and site inventory limits These guideline values refer to radiation and radioactivity above normal background levels Guidelines for direct radiation are expressed in units of exposure rate, i e microroentgens per hour (μR/hr) Surface activity guideline values, applicable to building or equipment surfaces, are expressed in units of activity per unit surface area [disintegration per minute per 100 cm^2 ($dpm/100cm^2$)] Volume concentration guideline values, which are applied to soil, induced activity, and debris, are expressed in terms of activity per unit mass [typically, picocuries per gram (pCi/g)] Site inventory limit refers to the total quantity of residual radioactive material permitted to remain onsite following completion of remedial action, this value is expressed in units of activity, i e , microcuries (μCi) or millicuries (mCi)

The release of the site, facilities and materials remaining onsite will be based on proper application of surface contamination, volume concentration, soil/water concentrations and exposure rate release criteria The objective of the decommissioning process is to remove a facility from service and reduce residual radioactivity to a level that permits either

1 Release of Facility for unrestricted use, or

2 Release of Facility under restricted conditions

The general decision flow for this process is shown in Figure 1-1, Decision Chart for Choosing Unrestricted or Restricted Release of Facility

The criterion for Unconditional Release of RFETS Facilities is

- The Total Effective Dose Equivalent (TEDE) to the reasonably maximally exposed member of the public does not exceed 15 mrem/year The unrestricted release criteria for building surfaces and material are contained in Table 1-1
- No institutional or active control measures will be required

The criterion for Restricted Release of RFETS Facilities is

- Facilities/sites will be decontaminated until further reductions in residual radioactivity are not technically achievable, would be prohibitively expensive, or would result in net public or environmental harm Building specific release criteria will be developed using an appropriate dose model (RESRAD) and approved as part of the Decommissioning Operations Plan (DOP)
- The Total Effective Dose Equivalent to the reasonably maximally exposed member of the public (the public), if institutional controls failed, shall not exceed 85 mrem/year

Two basic methods for demonstrating compliance with release criteria will be used

1 Compare final survey results for equipment and surfaces directly to the values contained in Table 7 1, or

2 Compare final volumetric survey results to limits derived using the generic dose conversion factions contained in NUREG/CR 5512, or limits derived using a site/facility (e g , RESRAD)

Background Determination

Background levels of radiation will be determined principally by taking radiological measurements of various construction materials (i e , concrete, metal, tile, soil, etc) within onsite, or offsite buildings of similar construction, but having no history of radioactive contamination Background measurements will include both "instrument background" and naturally occurring background radioactive materials, including enhanced background radiation levels due to fallout

Efforts will be made to find structures and materials with approximately the same physical characteristics as the facility undergoing decommissioning The sampling scheme, sample locations, number, and statistical evaluation will be based on the guidance in NUREG/CR 5849 and/or MARSSIM

Background response will be established for each type of instrument or measurement to be used The objective of the background determination are to

- Assure reliable instrument operation,
- Establish the reference background values for each type of instrument - detector to be used in the survey
- Assess the variability in background responses for principal detectors under different applications and conditions of use, and
- Determine the need for correction factors or special measurements to establish the background of final survey measurements

Collection of background data will be performed in accordance with approved procedures appropriate for the instrumentation used Background determination will include the following

Direct Surface Beta-Gamma Measurements

Direct measurements will be made of similar building construction materials This will assess the influence of naturally occurring radionuclides The number of background measurements is dependent upon the types of facility materials

Direct Surface Alpha Measurements

Similar protocols to those used to determine the direct beta-gamma Special counting techniques may be required to assess the influence of naturally occurring radionuclides

Removable Surface Beta - Gamma Measurements

Background determinations for removable beta-gamma measurements will be made by taking a series of blank smears collected from an area verified free of facility radioactive material

Removal Surface Alpha Measurements

Background determinations for removable Alpha measurements will use same protocol as that for removable surface beta-gamma background

Gamma Exposure Rate Measurements

Measurements will be made in various facilities with similar geometry and construction material Attempts will be made to evaluate local background variations due to natural radioactivity in construction materials, (e g , K-40) in the walls and floors of the area being surveyed and shielding of cosmic radiation

Soil and Water Activity Measurements

Soil and water samples will be collected, if required, from the areas unaffected by facility operations

Classification of Areas by Contamination Potential

All areas of the RFETS (including structures, plant systems and outdoor areas) will not have the same potential for residual contamination and therefore will not require the same level of survey coverage to achieve an acceptable level of confidence that the facility satisfies the established release criteria By designing the survey such that areas with higher potential for contamination receive a higher degree of survey effort, the process will be both effective and efficient

Classification of areas will be based on results of radiological characterization data, history of operations and potential for radioactive contamination and operational radiological surveys performed during building disposition Each survey area will be classified as follows

- Class 1 Impacted (Affected) Areas are areas that have potential contamination (based on building operating history) or known contamination (based on past or preliminary characterization survey data) This would normally include areas where radioactive materials were used and stored and where records indicate spills or other unusual occurrences could have resulted in the spread of contamination The survey frequency will be a minimum of one fixed survey measurement and one removable survey measurement per square meter In addition, a scan survey for alpha and beta of 100% of the applicable surface areas, including fixed equipment, is required

- Class 2 Impacted Areas are areas that have or had a potential for radioactive contamination or known contamination, but are not expected to exceed the applicable contamination limits The survey frequency will be a minimum of one fixed survey measurement and one removable survey measurement at intervals as determined utilizing MARSSIM statistical calculations In addition, a scan survey for alpha and beta of 10 to 100% of the applicable surface areas, including fixed equipment, will be performed as directed by Radiological Engineering Personnel

- Class 3 Impacted (Unaffected) Areas are all areas not classified as Class 1 or Class 2 Impacted or Non-Impacted These areas are not expected to contain residual contamination above the limits, based on knowledge of building history and previous survey information However, insufficient documentation is present to exclude the area from survey requirements The survey frequency will be a minimum of one fixed survey measurement and one removable survey measurement per 50 square meter or 30 points, whichever is greater In addition, a scan survey for alpha and beta of 10% of the applicable surface areas, including fixed equipment, is required

- Non-Impacted Areas are all areas not classified as Class 1, Class 2 or Class 3 Impacted These areas have no reasonable potential for residual contamination, based on knowledge of building history and/or previous survey information Sufficient information is present to be assured that no residual contamination is present above the acceptance criteria

Gridding and Marking Measurement Location

To assure that all affected area surfaces and structures are adequately surveyed during final survey, a square or other appropriate geometric grid will be superimposed on surfaces being surveyed The grids may be physically marked on the surfaces or, as a minimum, the measurement location will be labeled if survey results show values above limits Grids may be marked on a survey sheet as well and not marked in the building The primary purpose of the grid is to facilitate systematic selection of measurement or sampling locations and provide a mechanism for referencing a measurement or sample back to a specific location

Measurement locations will be clearly identified to provide a method of referencing survey results to survey area locations Whenever it is appropriate and cost effective, griding will be used However, the physical grid layout may be substituted with surface makings or labels Due to the large number of obstructions, non-uniform surfaces and complex geometries remaining in some facilities, griding will be used only for portions of impacted areas Unimpacted survey areas will not generally be gridded

Instrumentation

Radiation detection and measurement instrumentation for final surveys will be selected to provide reliable operation and adequate sensitivity to demonstrate that the measurements taken are sufficient to conclusively demonstrate that the release limits have been met Commercially available portable and laboratory instruments and detections produced by several manufacturers will be selected based upon detection sensitivity, operating characteristics and expected performance in the field A listing of typical detectors and their detection characteristics are summarized in Tables 2 and 3 However, surveys will be performed using the most suitable equipment available and survey measurements shall not be limited to this listing Data quality objectives (DQOs) for final survey measurements will be established and documented in accordance with Characterization and Survey Procedures

Each instrument will be calibrated and maintained to enable the readout (usually in counts or counts per minute) to be converted to units in which the guideline levels are expressed Instruments and detectors used to conduct final survey will be calibrated and maintained in accordance with applicable instrumentation procedures Radioactive sources used for the purpose of calibration will be traceable to the National Institute of Standards and Technology (NIST)

Periodic checks of instrument response will be performed (normally daily or prior to use) to assure that calibration and background have not changed Following calibration, instrument response will be determined and acceptable range of response established Instrument response tests will be performed and documented typically prior to beginning the days measurements to assure continued acceptable operation If the instrument response does not satisfy the established acceptable range, the instrument will be removed from service until the reason for the deviation can be determined and resolved and acceptable response again demonstrated If repair and/or recalibration is necessary, acceptable response ranges will be reestablished and documented

Final Survey Reporting

A summary of the measurement results and overall conclusions showing that the facility meets the release criteria will be provided As applicable, a tabular data summary will present the results for each major category of survey unit such as structures, components and facility systems This tabulation will identify the number of survey units, the number and type of measurements such as total surface beta-gamma, total surface alpha, removable surface beta-gamma and removable surface alpha activity concentration, and gamma exposure rate For surface contamination, exposure rate and concentrations in soil and water, the average and maximum values, and upper the limit of the confidence interval about the mean will be reported for comparison to the release criteria Typically, these results will also be illustrated in a graphical presentation to illustrate the individual data points and the statistical distribution of the results

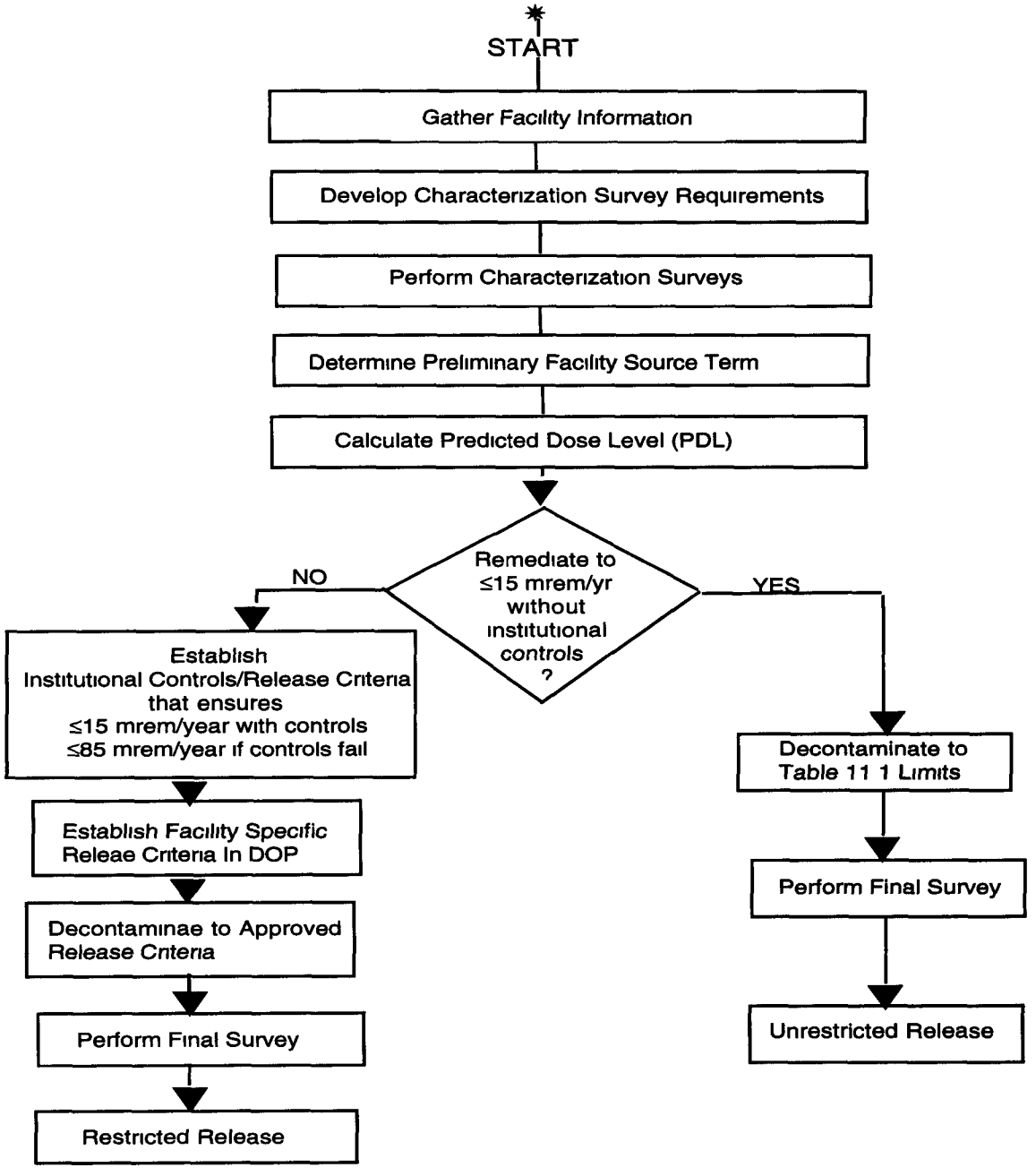
Within the release record for each survey unit (and/or subunit), the number of measurements and the applicable statistical distribution will typically be presented in graph form These will be reported in units of dpm/100 cm^2 for each type of surface activity measurement, total surface beta-gamma, total surface alpha, removable surface beta-gamma and removable surface alpha activity concentration Exposure rate measurements will be reported in units of *F*R/hr, and soil and water activity in units of pCi/g or pCi/ml, respectively The applicable results of special sampling measurements, e g , sediment, paint, concrete and other debris will be reported in the release record for each survey unit

Independent Verification

An independent verification is necessary in order to validate the accuracy and completeness of final survey measurements to ensure that the facility/site meets the established release criteria

The level of verification required by the Independent Verification Contractor (IVC) may range from a simple review of the decommissioning plans and final survey results, to onsite visits involving direct measurements and sampling The level of verification is determined by DOE with input from the IVC Verification activities may be required throughout the decommissioning effort and are therefore integrated into overall project planning

After acceptance of the final survey report, the DOE may perform (or arrange for its agent to perform) a confirmatory survey As the name implies, a confirmatory survey is performed to confirm the adequacy and accuracy of the final survey The confirmatory survey develops radiological data of the same type as that presented in the final survey, but is usually limited in scope to spot-checking conditions at selected site locations, comparing findings with those of the status survey, and performing independent statistical evaluations of the data developed by the confirmatory survey and the final survey Although the scope may vary, a confirmatory survey typically addresses from 1 to 10% of the site, but may be extended, if questions or anomalies develop or are identified This survey is used in supporting a decision to release the facility



'igure 7 1 ***Decision Chart for Choosing Unrestricted or Restricted Release of a Facility***

Table 7.1 Summary of Contamination Values for Unrestricted Release

RADIONUCLIDE (1)	**Average Total (Fixed + Removable) Contamination (3,4) dpm/100cm² (2)**	**Maximum Total (Fixed + Removable) Contamination (5) dpm/100cm² (2)**	**Removable Contamination (2,6) dpm/100cm² (2)**
Transuranics, I-125, I-129, Ra-225, Ac-227, Ra-228, Th-230, Pu-231	100	300	20
Th-(natural Sr-90, I-125, I-131, I-131, Ra-223, Ra-224, U-232, Th-232	1,000	3,000	200
U-(natural), U-235, U-236, & associated decay products, alpha emitters	5,000	15,000	1,000
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 & others noted above (7)	5,000	15,000	1,000

Limits in this table are from the Nuclear Regulatory Commission Regulatory Guide 1 86

NOTES

(1) Where surface contamination by both alpha and beta-gamma emitting radionuclides exists, the limits established for alpha and beta-gamma emitting radionuclides should apply independently

(2) As used in this table, disintegrations per minute (dpm) is defined as the rate of emission by radioactive material as determined by correcting the counts per minute measured by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation

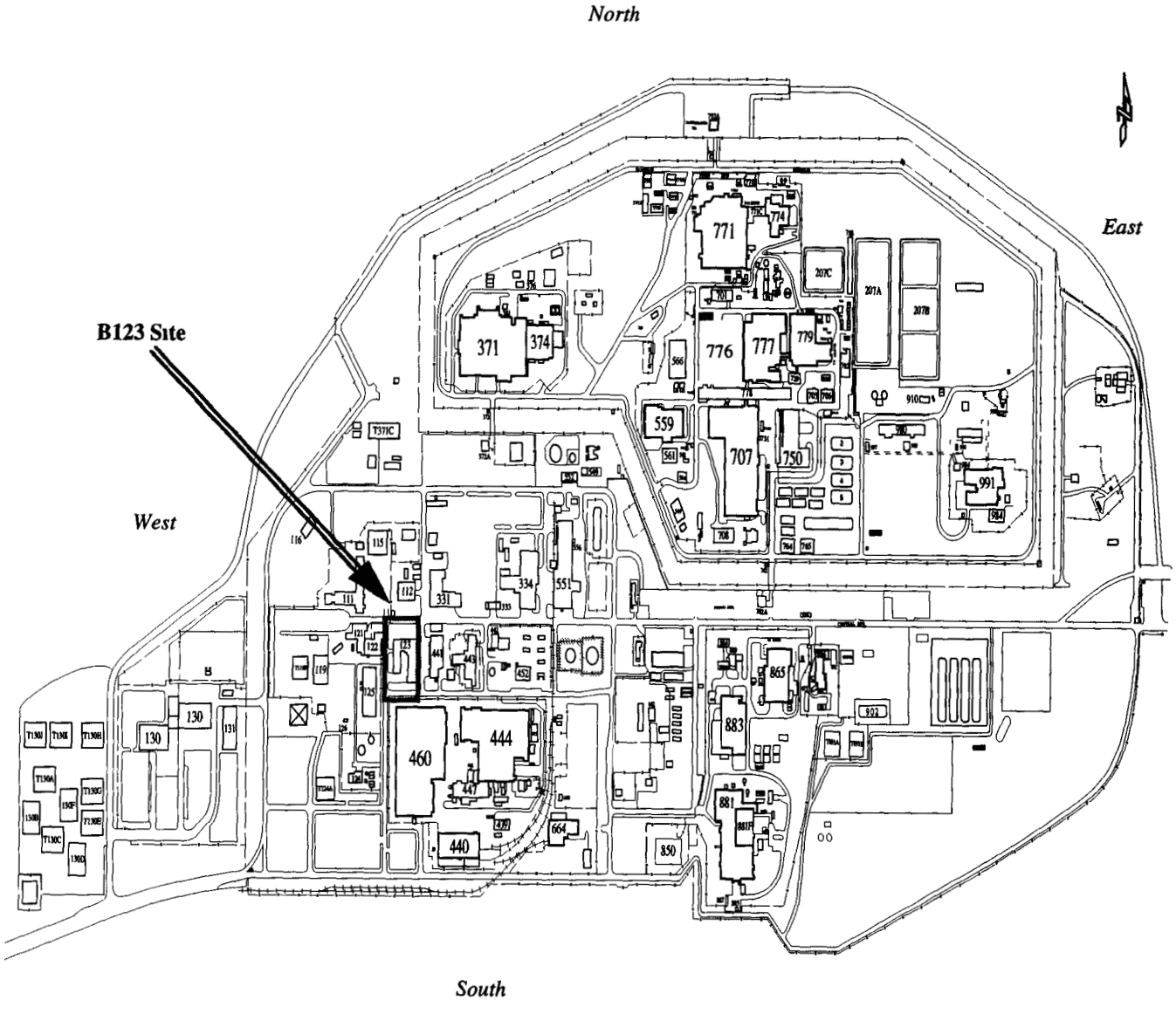
(3) Measurements of average contamination should not be averaged over an area of more than 1 meter² For objects with a total surface area of less than 1 meter², the average should be derived for each object

(4) The average exposure rate measured at one meter from accessible surfaces should be limited to 5 FR/hr above background

(5) The maximum contamination level applies to an area of not more than 100cm²

(6) The amount of removable material per 100cm² of surface area should be determined by wiping an area of that size with a dry filter of soft, absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wipe with an appropriate instrument of known efficiency When removable contamination on objects of surface area less than 100cm² is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped Except for transuranics and Ra- 228, Ac- 227, Th 228, Pa 231 and alpha emitters, it is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate the total residual surface contamination levels are within the limits for removable contamination

(7) This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched


North
East
West
South
B123 Site
771
774
207C
207A
207B
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984
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334
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